

US009388627B2

(12) **United States Patent**
Rawlings

(10) **Patent No.:** **US 9,388,627 B2**
(45) **Date of Patent:** **Jul. 12, 2016**

(54) **METHOD OF MANUFACTURING AN INSULATED FRAME MEMBER**

(71) Applicant: **Architectural & Metal Systems Limited**, Little Island, County Cork (IE)

(72) Inventor: **David Rawlings**, Bishops Cleeve (GB)

(73) Assignee: **ARCHITECTURAL & METAL SYSTEMS LIMITED**, Little Island (IE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 157 days.

(21) Appl. No.: **13/894,273**

(22) Filed: **May 14, 2013**

(65) **Prior Publication Data**
US 2013/0247486 A1 Sep. 26, 2013

Related U.S. Application Data

(62) Division of application No. 12/828,008, filed on Jun. 30, 2010, now abandoned.

(30) **Foreign Application Priority Data**

Jul. 15, 2009 (IE) 2009/0538

(51) **Int. Cl.**
E06B 3/964 (2006.01)
E06B 3/263 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **E06B 3/263** (2013.01); **B29C 39/22** (2013.01); **B29C 44/1285** (2013.01); **E06B 3/26303** (2013.01); **E06B 3/26307** (2013.01); **E06B 2003/26316** (2013.01); **E06B 2003/26325** (2013.01); **E06B 2003/26352** (2013.01);
(Continued)

(58) **Field of Classification Search**

CPC . E06B 3/263; E06B 3/26301; E06B 3/26303; E06B 3/2632; E06B 2003/26378; E06B 2003/26383; E06B 3/267; E06B 3/2675
USPC 29/897.32, 897.312, 530; 52/309.4, 52/309.5, 578, 656.1, 656.2, 656.5, 656.6, 52/717.02

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,832,818 A 9/1974 Nahr
3,861,085 A 1/1975 Jacob

(Continued)

FOREIGN PATENT DOCUMENTS

CA 2672202 A 7/2008
DE 4424865 A1 1/1996

(Continued)

OTHER PUBLICATIONS

US Office Action, received in U.S. Appl. No. 12/282,008, dated Aug. 27, 2012, in 15 pages.

(Continued)

Primary Examiner — David Bryant

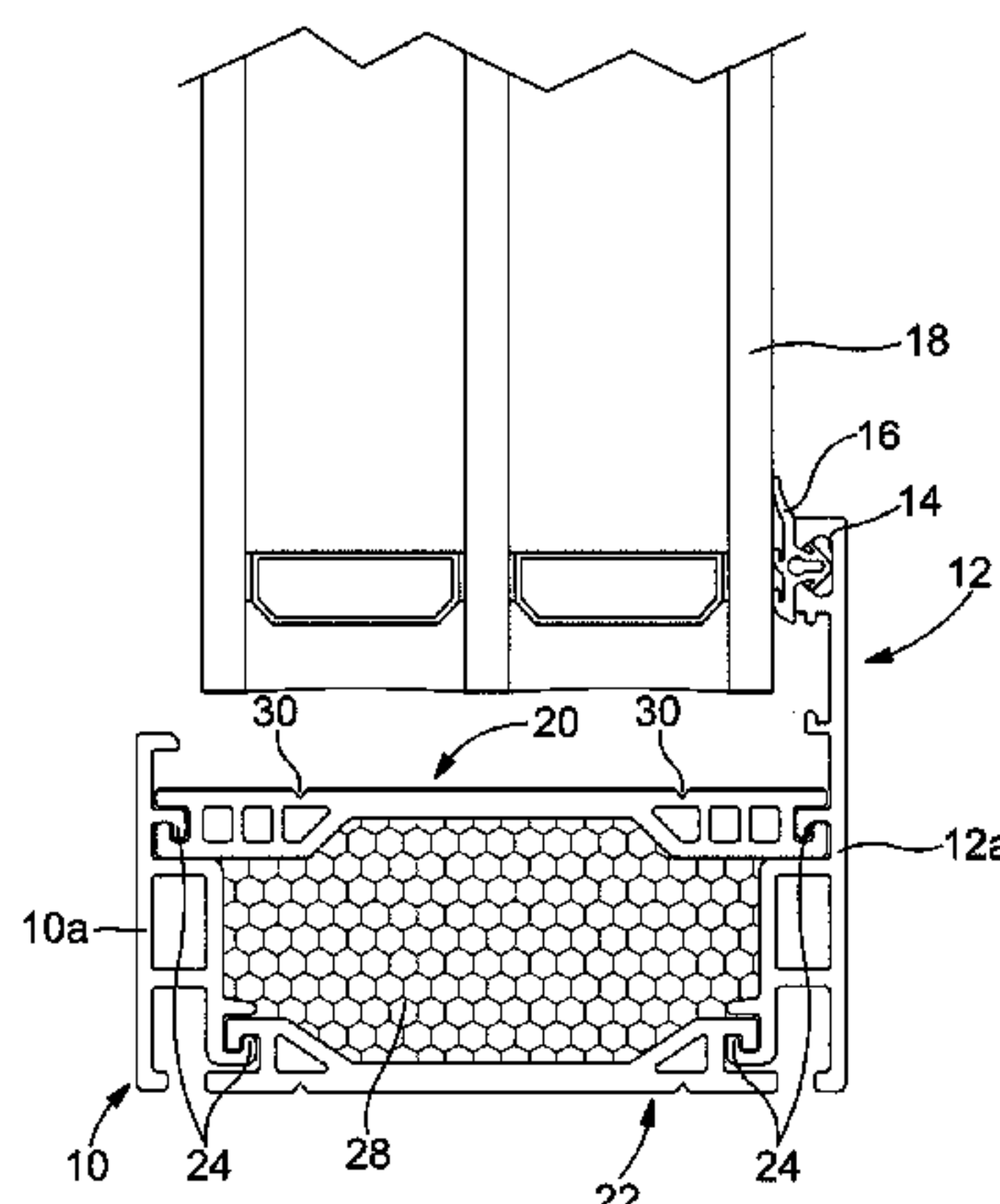
Assistant Examiner — Jun Yoo

(74) *Attorney, Agent, or Firm* — Knobbe Martens Olson & Bear LLP

(57) **ABSTRACT**

A method of manufacturing an insulated frame member including first and second frame components held in a spaced relationship by a first, glazing unit facing connector component and by a second connector component, the first and second frame components together defining a void substantially filled with a foamed material, wherein the first connector component is of width greater than or equal to the thickness of the glazing unit.

11 Claims, 1 Drawing Sheet



(51)	Int. Cl. <i>B29C 39/22</i> <i>B29C 44/12</i>	(2006.01) (2006.01)	2006/0018095 A1	1/2006	Rawlings	
			2008/0245027 A1	10/2008	Lambertini	
			2010/0146883 A1 *	6/2010	Benkel	52/204.64

(52)	U.S. Cl. CPC	<i>E06B2003/26361</i> (2013.01); <i>E06B</i> <i>2003/26387</i> (2013.01); <i>Y10T 29/49993</i> (2015.01)

FOREIGN PATENT DOCUMENTS

(56) **References Cited**
U.S. PATENT DOCUMENTS

4,069,631	A	1/1978	Nahr	
4,096,678	A	6/1978	Diels et al.	
4,219,983	A	9/1980	Kern et al.	
4,524,112	A	6/1985	Willert	
4,841,696	A *	6/1989	Miller	52/202
5,117,601	A	6/1992	Habicht	
5,216,810	A	6/1993	Kendall	
6,035,596	A	3/2000	Brunnhofe	
6,035,600	A	3/2000	Habicht et al.	
6,202,353	B1	3/2001	Giacomelli	
7,104,019	B2	9/2006	Brunnhofe	
7,987,633	B2	8/2011	Lenox et al.	
8,051,622	B2	11/2011	Dampierre	
8,112,941	B2	2/2012	Lenox et al.	
8,286,396	B2 *	10/2012	Brunnhofe et al.	52/204.71
2002/0046539	A1	4/2002	Schulz	
2005/0115193	A1	6/2005	Brunnhofe	

DE	4424928	C1	3/1996
DE	9422032	U1	11/1997
DE	20313884	U1	11/2003
DE	102004038868	A1	2/2006
DE	202007004804	U1	6/2007
EP	0007416		2/1980
EP	0799964	A1	10/1997
EP	0848781	A	6/1998
EP	1154115	A1	11/2001
EP	1255019	A2	11/2002
FR	2792676	A1	10/2000
WO	WO 97/22779	A	6/1997
WO	WO 98/40594	A1	9/1998
WO	WO 00/71849	A1	11/2000

OTHER PUBLICATIONS

Extended European Search Report in Application No. EU 10251161.5, dated Dec. 18, 2012.
Great Britain Search Report in Application No. GB 1010696.1, dated Sep. 29, 2010.
Great Britain Search Report in Application No. GB 1010696.1, dated Jun. 20, 2013.
European Office Action for European Application No. 10251161.5 dated Nov. 10, 2015 in 5 pages.

* cited by examiner

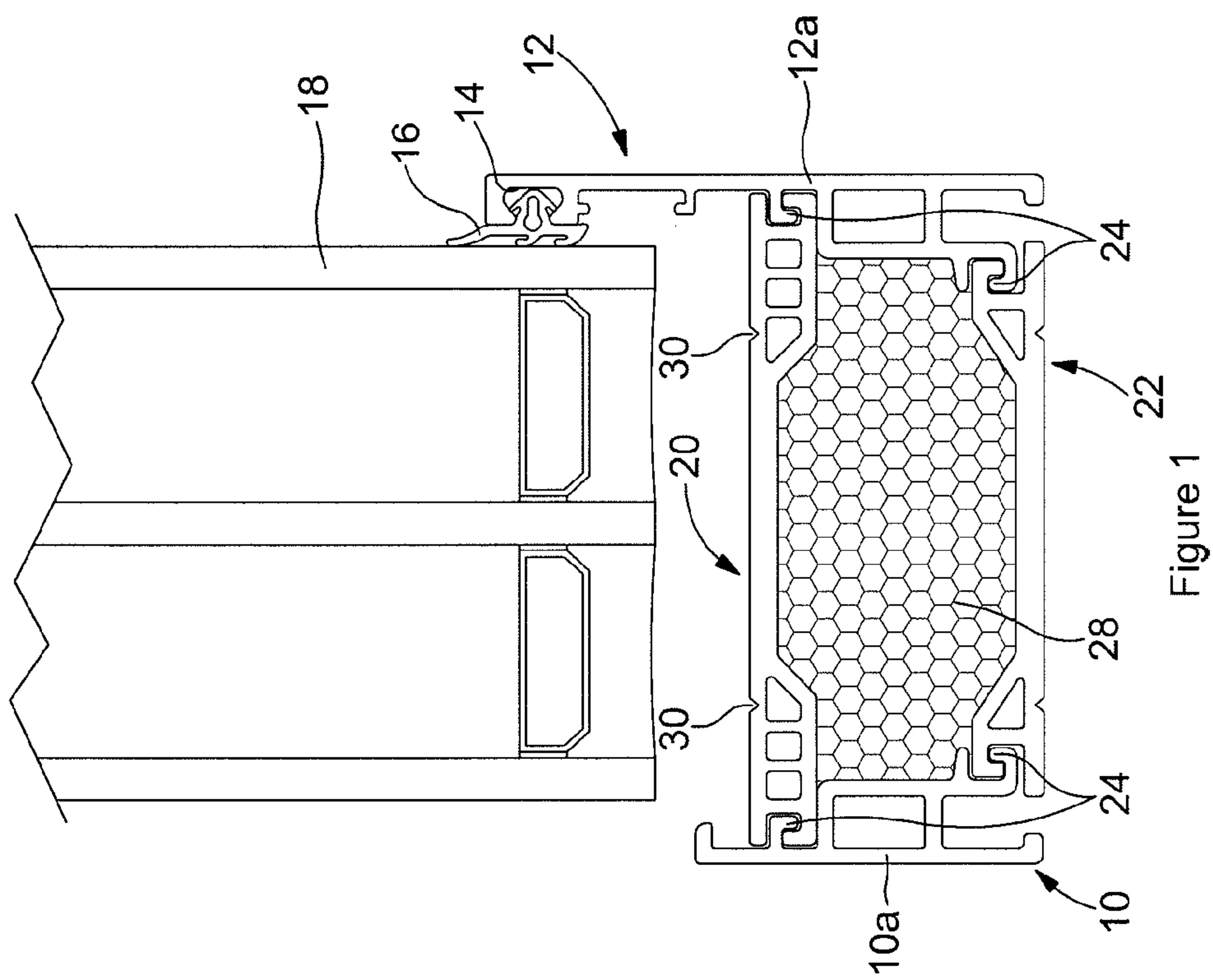


Figure 1

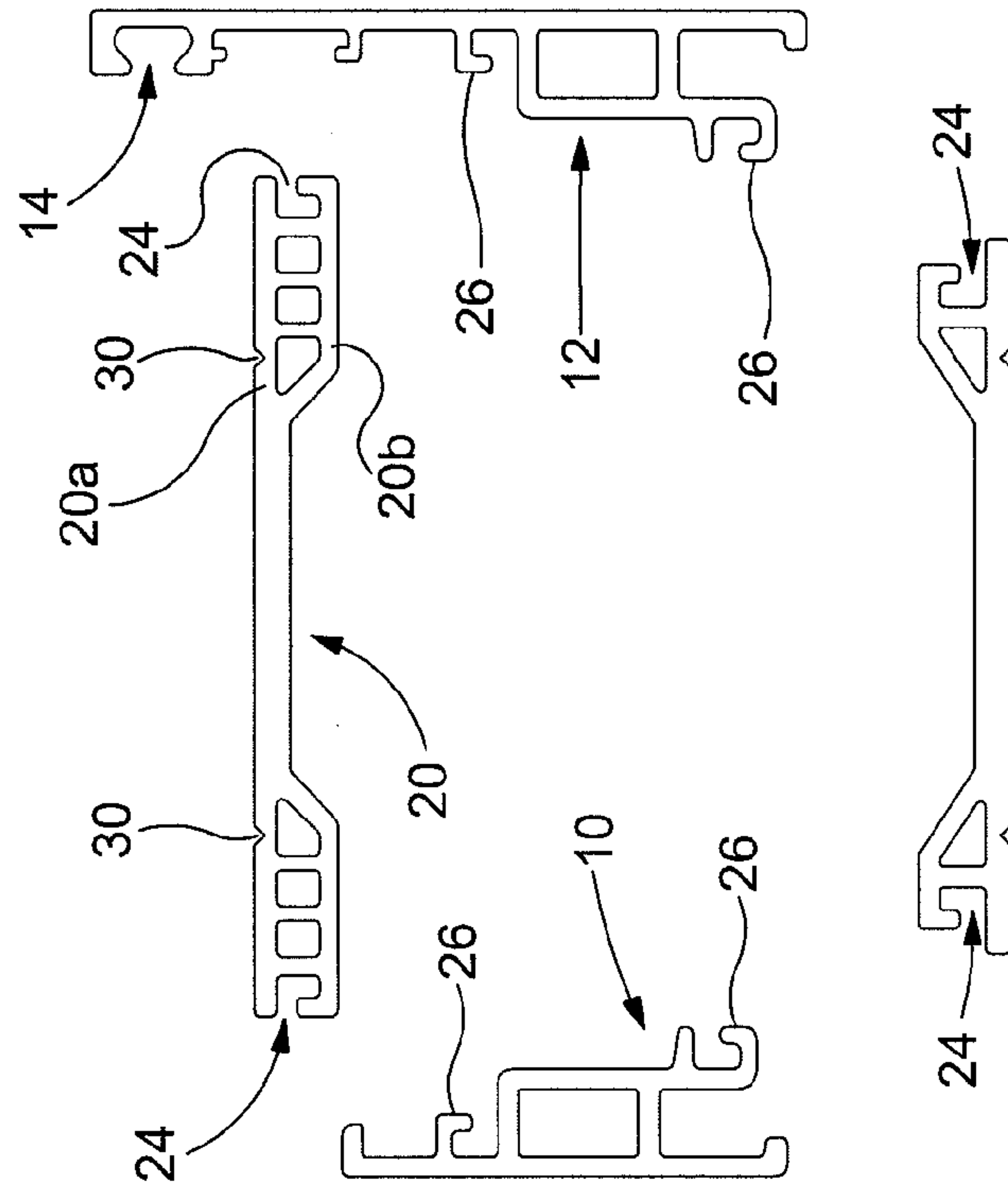


Figure 2

1

**METHOD OF MANUFACTURING AN
INSULATED FRAME MEMBER****CROSS-REFERENCE TO RELATED
APPLICATIONS**

This application is a divisional application of U.S. patent application Ser. No. 12/828,008, filed on Jun. 30, 2010, which claims priority under 35 U.S.C. §119 to Ireland Patent Appl. No. 2009/0538, filed on Jul. 15, 2009, which is incorporated in its entirety by reference herein.

BACKGROUND

1. Field

This invention relates to an insulated frame member suitable for use in the formation of a window or door frame or the like. In particular, the invention relates to an insulated frame member of the type including first and second, or inner and outer, elongate metallic frame components and a thermal break interconnecting the frame components.

2. Description of the Related Art

One type of insulated frame member is described in EP 0007416 and comprises inner and outer extruded aluminum frame components which are interconnected by a pair of plastics material connector components in such a manner as to define an elongate void bounded by the frame components and connector components, the void being filled by a foamed insulating material. During manufacture, the foamed material expands to fill the void and to lock together the frame components and connector components to form a strong, rigid thermal break between the frame components. The frame member is also of good strength and rigidity.

SUMMARY

According to certain embodiments of the invention, there is provided an insulated frame member comprising first and second frame components held in a spaced relationship by a first, glazing unit facing connector component and by a second component, the first and second frame components together defining a void substantially filled with a foamed material, wherein the first connector component is of width greater than or equal to the thickness of the glazing unit.

As a result, radiation and convection losses from the glazing unit to the frame components can be reduced.

Preferably the first connector component extends from an outer wall of the outer frame component to an inner wall of the inner frame component.

Certain embodiments of the invention further relate to a door or window frame manufactured from at least one such frame member.

BRIEF DESCRIPTION OF THE DRAWINGS

Certain embodiments of this invention will further be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a sectional view illustrating an insulated frame member in accordance with one embodiment of the invention; and

FIG. 2 is an exploded view illustrating parts of the embodiment of FIG. 1.

DETAILED DESCRIPTION

It is desirable to enhance the thermal efficiency of buildings. One area that is important in achieving good thermal

2

efficiency is in the construction of window and door frames. One object of certain embodiments of the invention is to provide an insulated frame member suitable for use in meeting the PassivHaus standard, although certain other embodiments of the invention are suitable for use in other applications.

Although the insulated frame member of EP 0007416 described above includes a thermal break which may be effective in reducing the conduction of heat between the inner and outer frame components, it is thought to be unsuitable for complying with more up-to-date, stringent requirements and so is unsuitable for reaching the PassivHaus or other modern standards.

The insulated frame member illustrated in FIGS. 1 and 2 comprises an inner extruded metallic frame component 10 and an outer extruded metallic frame component 12. Although specific profiles are illustrated in the accompanying drawings, it will be appreciated that the invention is not restricted to these specific profiles, but rather extends to a number of modifications and alterations thereto. The outer frame component 12 includes an outer wall 12a and is shaped to define a recess 14 adapted to receive part of a sealing gasket 16 which seals, in use, against the outer face of a glazing unit 18. In the arrangement illustrated, the glazing unit 18 is of the triple glazed form. However, it will be appreciated that the invention is not restricted to such arrangements and that it is equally applicable to, for example, double-glazed arrangements. The inner frame component 10 includes an inner wall 10a and is adapted to have secured thereto a glazing bead (not shown) which bears against the opposing surface of the glazing unit 18, in use, to secure the glazing unit 18 in position.

The inner and outer frame components 10, 12, are held in a spaced relationship by first and second connector components 20, 22. The connector components 20, 22 are each of extruded form, being manufactured from a suitable plastics material. Each of the connector components 20, 22 is shaped to define mounting recesses 24 which, in use, receive corresponding mounting formations 26 of the inner and outer frame components 10, 12.

As shown in FIG. 1, it will be appreciated that the assembly of the inner and outer frame components 10, 12 and first and second connector components 20, 22 defines a void of elongate form which, as shown in FIG. 1, is filled with a foamed insulating material 28.

It will be appreciated that the provision of the first and second connector components 20, 22 and foamed insulating material 28 connecting the inner and outer frame components 10, 12 to one another provides a good thermal break resisting the conduction of heat energy between the inner and outer frame components 10, 12. The first connector component 20 which faces the glazing unit 18, in use, extends across substantially the full width between the inner wall 10a of the inner frame component 10 and the outer wall 12a of the outer frame component 12, and thus is of width greater than the thickness of the glazing unit 18. As a result, it will be appreciated that most heat energy radiating from the edges of the glazing unit 18 will not be incident upon a relatively good thermal conductor in the form of part of one or other of the frame components 10, 12, but rather will be incident on a plastics component of poor thermal conductivity. Radiation losses are thus reduced. By reducing radiation of heat energy from the glazing unit 18 to the frame components 10, 12 it will be appreciated that the thermal efficiency of the insulated frame member is enhanced. Further, convection losses in the space between the frame member and the glazing unit 18 are reduced.

As illustrated, the first connector component **20** is provided with mounting locations **30** in the form of grooves to assist in the correct location of, for example, friction stay tracks or other components. Typically, such components are secured in position using screws. As the first connector component **20** is of double walled form at these locations, including an outer wall **20a** and an inner wall **20b**, it will be appreciated that such screws are firmly secured in position, the dual wall formation of that part of the connector component **20** providing additional anchorage for the screws as well as enhancing the stability of the screws.

During assembly of the insulated frame member, the first and second connector components **20**, **22** are secured to the inner frame component **10** by sliding the first and second connector components **20**, **22** onto the inner frame component **10** from one end thereof, the formations **26** being introduced into the recesses **24** of the connector components **20**, **22**. It will be appreciated that the combination of the inner frame component **10** and connector components **20**, **22** together defines an open channel into which a thermally insulating foaming material is introduced. The outer frame component **12** is then secured to the first and second connector components **20**, **22** by sliding the outer frame component **12** into position in a manner similar to that by which the connector components **20**, **22** are secured to the inner frame component **10**. Shortly after the outer frame component **12** is secured in position, the thermally insulating foaming material will have commenced foaming and will fill the void defined between the connector components **20**, **22** and frame components **10**, **12**. The foaming and expansion of the thermally insulating foaming material **28** serves to lock together the frame and connector components **10**, **12**, **20**, **22** enhancing the rigidity of the frame member as well as providing a thermal break therebetween.

Alternatively, the frame and connector components **10**, **12**, **20**, **22** may be assembled to form an elongate component defining an elongate void, and liquid foaming material may be injected into the void, for example from an end thereof or through one or more openings formed in one or other of the components, for example through an opening formed at the mid-point of the assembly. Such an arrangement requires the use of less equipment during assembly and lends itself to being supported in a static jig to maintain straightness during foaming, although this may not always be necessary.

In the arrangement illustrated, the void is of symmetrical form, thus during foaming the foam will tend to apply equal opposite pressures to the aluminum sections, assisting in maintaining straightness with minimal use of jigs.

In use, the frame member can be used in the construction of door or window frames or the like and the invention extends not only to the insulated frame member itself but also to frames manufactured therefrom. If desired, a reverse butt joint can be used, where appropriate, as the connector components **20**, **22** are shaped in such a manner that the thermal break is substantially symmetrical.

It is envisaged that when used with a triple glazed glazing unit **18**, a door or window frame formed using the insulated frame member will have a U value of approximately 0.8 and an A energy rating. Such a frame would therefore be suitable for use in a building satisfying the PassivHaus standard. It will be appreciated, however, that the insulated frame member may be used in other applications.

A number of modifications or alterations may be made to the arrangement described hereinbefore without departing from the scope of the invention.

What is claimed is:

1. A method of manufacture of an insulated frame member for supporting a glazing unit, the insulated frame member comprising first and second frame components of a relatively high thermal conductivity material held in a spaced relationship by a first connector component and by a second connector component, the first and second connector components being of a relatively low thermal conductivity material, the first connector component facing towards the glazing unit, in use, the first and second frame components together defining a void substantially filled with a foamed material, the method comprising the steps of:

(a) assembling the first and second frame components and the first and second connector components by sliding the frame and connector components relative to one another in a longitudinal direction of the frame member to define the void; and

(b) introducing a foamable material into the void and foaming the foamable material in situ to exert a pressure upon the first and second frame components and upon the first and second connector components, wherein the first connector component is of a width greater than or equal to the thickness of the glazing unit, the first connector component extending from an outer wall of the insulated frame member defined by the first frame component to an inner wall of the insulated frame member defined by the second frame component, wherein the first connector component has longitudinal edges each of which is provided with a pair of spaced projections that define therebetween respective L shaped mounting recesses receiving, in use, corresponding L-shaped mounting formations of the first and second frame components.

2. A method according to claim 1, wherein the void is of a substantially symmetrical form, with respect to a plane parallel to a longitudinal axis of the frame member.

3. A method according to claim 1, wherein the first connector component is provided with an elongate location marking.

4. A method according to claim 3, wherein the first connector component is of double walled form adjacent the elongate location marking.

5. A method according to claim 4, wherein the first connector component is provided with a pair of location markings and associated double walled regions.

6. An insulated frame member manufactured according to the method of claim 1.

7. A frame for at least one of a window and a door, the frame comprising at least one insulated frame member according to claim 6.

8. A frame according to claim 7, further comprising a glazing unit configured to fit within the frame.

9. A method according to claim 1, wherein the liquid foaming material is injected into the void from an end thereof.

10. A method according to claim 1, wherein the liquid foaming material is injected into the void through an opening that opens into the void part way along the length thereof.

11. An insulated frame member for supporting a glazing unit, the insulated frame member comprising first and second frame components of a relatively high thermal conductivity material held in a spaced relationship by a first connector component and by a second connector component, the first and second connector components being of a relatively low thermal conductivity material, the first connector component facing towards the glazing unit, in use, the first and second frame components together defining a void substantially filled with a foamed material, wherein the first connector component is of a width greater than or equal to the thickness

5

of the glazing unit, the first connector component extending from an outer wall of the insulated frame member defined by the first frame component to an inner wall of the insulated frame member defined by the second frame component, wherein the first connector component has longitudinal edges 5 each of which is provided with a pair of spaced projections that define therebetween respective L-shaped mounting recesses receiving, in use, corresponding L-shaped mounting formations of the first and second frame components.

* * * * *

10

6